A Sustainable Future

Teaching and Learning Lesson Plans for the Early Years

- Environmental Education,
- Science &
- Maths.

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A Sustainable Future. Solids, Liquids & Gases

Questions to stimulate children's thinking

- What will happen if . . .?
- Why does that happen?
- How could we change that?
- Where could you find. . ?
- Is that a good thing or a bad thing? Why?
- What do you think about that?

Philosophical concepts to encourage children's analysis, reflection and debate

- Right/Wrong
- Good/Bad
- Fair/Unfair
- Need/Want
- Rights/Responsibilities
- Respect
- Love
- Values

Language to develop children's vocabulary and communication

- Solids, Liquids, Gases
- Materials - Plastic, Wood, Metal. . .
- Suitability
- Decomposition/Decay
- Cycle/Algorithm/Pattern
- Photosynthesis
- Climate Change, Carbon Footprint
- Engineer, Scientist. . .
- Carbon Dioxide/Oxygen
- Environmental/Ecosystems
- Sustainability
- Conservation/Preservation
- Deforestation/Destruction
- Recycling/Waste
- Manmade/Natural
- Evaporation/Condensation
- Dependent/Partnership/Collaboration
- Survive
- Problem Solve/Reflect/Evaluate

Solids, Liquids & Gases

Overarching Twelve Week Focus

Materials and their properties

Weekly Aim

Week 1 Solids: Origin of materials

Stimulus

Food – rice, coffee, olives & apples, wood and paper, sand, glass, metal can, cardboard box, plastic, vegetable oil, coal and crystals.

Input Framework

Children will explore a range of materials throughout the week, using all of their senses, discussing where these materials come from and what makes them a solid. Children will be enabled to understand that everything we use comes from nature in its rawest form and the way humans manipulate the materials changes them into manmade forms. Using videos and images, children will explore whether materials come from plants, trees, inside the earth . . . and how we extricate these materials – deforestation, mining, farming . . . Children will discuss the human impact of our appetite for all of nature's materials. Classification investigations will be conducted using simple Venn diagrams to organise materials into natural/manmade and under the ground/above the ground. Debate around the ethics of our use of materials will be encouraged and children will be empowered to agree and disagree depending on their personal perspectives.

EYFS Curriculum links

Understanding the World. The World

- Explore collections of materials with similar and/or different properties
- Talk about what they see, using a wide vocabulary
- Begin to understand the need to respect the natural environment and all living things

Next steps for learning

Take one of the materials that has been explored and identify as many as possible examples of when that material is used in an average lesson/journey to school/meal time . . . What would life be like without it?

Solids, Liquids & Gases

Overarching Twelve Week Focus

Materials and their properties

Weekly Aim

Week 2 Solids: Materials and their uses

Stimulus

Straw, sticks, metal cans, wooden bricks, plastic bottles – what will make a good boat?

Input Framework

Children will be given a variety of materials and a tray of water. Over the course of the week, children will test which materials would be suited best to making a boat. Children will consider the complexities of floating and sinking with regard to shape, weight and type of material. They will work collaboratively to test theories and evaluate outcomes. By the end of the week, children will have formed a collective decision about material suitability and will have had their awareness raised to this part of decision making within the engineering process.

EYFS Curriculum links

Understanding the World. The World

- Use all their senses in hands-on exploration of natural materials
- Explore how things work
- Talk about the differences between materials and changes they notice

Mathematics

- Talk about and explore 3D and 3D shapes
- Select shapes appropriately
- Begin to describe a sequence of events, real or fictional using words such as 'first', 'then . . .'

Next steps for learning

Look at these materials in relation to building structures like bridges, houses etc. What could happen if the wrong materials was chosen?

Solids, Liquids & Gases

Overarching Twelve Week Focus

Materials and their properties

Weekly Aim

Week 3 Solids: Manmade materials and recycling

Stimulus

A range of manmade materials and a bicycle - plastic drinks bottle, wellington boots, car tyre and metal saucepan.

Input Framework

Over the course of two days children hunt out, within their natural outdoor space, manmade objects which have been hidden. As each item is found children are encouraged to consider what materials these items have been made out of. Children will be encouraged to suggest different ways in which these items could be used. Online images will support this work. Midweek a bicycle will be added to the area and children will identify different materials that have been used to make the bicycle. The items we have already studied will be matched to areas of the bike as appropriate. The week will culminate in children voting to look at how one of these materials is made, for example, metal, rubber etc. Online videos will support this understanding and children will be taught about the carbon footprint which is associated with the production of this material and the damage to ecosystems around the globe from the manmade waste generated from this process.

EYFS Curriculum links

Understanding the World. The World

- Explore collections of materials with similar and/or different properties
- Talk about what they see, using a wide vocabulary
- Begin to understand the need to respect the natural environment and all living things
- Talk about the differences between materials and changes they notice

Next steps for learning

Invite children to bring into school an old/worn out shoe, boot, saucepan, bowl . . . and hold a planting day, where each item is used to grow seeds, plants, flowers etc. This is then sent home as inspiration for discussion.

Solids, Liquids & Gases

Overarching Twelve Week Focus

Materials and their properties

Weekly Aim

Week 4 Solids: Natural materials and decomposition

Stimulus

A range of natural materials, e.g. vegetables, leaves, fruit. Images of the decomposition cycle.

Input Framework

Throughout the week children explore different natural materials, using all of their senses. They discuss the origins of these materials and what we use them for. Children will make predictions about what will happen to these materials over time. They will be encouraged to think about whether the climate will make a difference to what happens to the materials and whether there are any other factors, e.g. insects. Samples of each material will be placed in individual trays and labelled. Children will revisit the materials weekly for the next six weeks and photograph the changes. A digital time line will be produced and used to enable children to reflect on and evaluate their investigation and what they have learned. Children will explore the cycle of composting and look at the benefits to the natural world - do animals and insects contribute to the process of recycling?

EYFS Curriculum links

Understanding the World. The World

- Talk about what they see, using a wide vocabulary
- Talk about the differences between materials and changes they notice

Mathematics

- Begin to describe a sequence of events, real or fictional using words such as 'first', 'then . . .'

Next steps for learning

How can we reduce waste of natural materials, for example food?

Solids, Liquids & Gases

Overarching Twelve Week Focus

Materials and their properties

Weekly Aim

Week 1 Liquids: What is a liquid?

Stimulus

Two tough spots – 1: a range of solids (toy train, wooden brick & metal bolt), 2: a range of liquids (water, milk, orange juice, paint and PVA glue).

Input Framework

Children freely explore the resources. Practitioner will pose a question – 'Which tray has liquids on it?' Children explore further and then represent their thoughts by standing next to the tray they think represents liquids. Practitioner will ask children to justify their position. Children are then asked to recall their learning about solids from the previous weeks. A definition of a liquid is then given to the children and reflective discussion is encouraged based on children's previous thoughts. Throughout the week, resources are mixed up and children are asked to reclassify them into the correct trays. Mid way through the week, a bucket of sand is introduced and a discussion about its properties is facilitated. Children explore wonderings about what liquids are used for and how often they are needed throughout a typical day in school. At the end of the week, children are encouraged to suggest where they think water comes from.

EYFS Curriculum links

Understanding the World. The World

- Use all their senses in hands-on exploration of natural materials
- Explore collections of materials with similar and/or different properties
- Talk about what they see, using a wide vocabulary

Mathematics

- Begin to describe a sequence of events, real or fictional using words such as 'first', 'then . . .'

Next steps for learning

What is the most important liquid found on our planet? What would happen without it? How much of our planet is covered by water & what types of water?

Solids, Liquids & Gases

Overarching Twelve Week Focus

Materials and their properties

Weekly Aim

Week 2 Liquids: Water Collection and Conservation

Stimulus

A range of bottles, buckets and trays to collect rain water in. Water spray bottles.

Input Framework

Children recap on the previous week's discussion about where water comes from. At the beginning of the week, different containers are available for rain water collection. On Monday, children place the containers carefully around the outdoor space to collect rainwater. Over the course of the week children are given similar containers to those already being used to collect water, along with water spray bottles. Children will explore which containers collect water the most easily. Discussion about why this happens is facilitated by the teacher. Children are shown images of different types of water collection systems in gardens and shown water butts. They are encouraged to think about why we save water and what we can use it for. Children measure their rain water collection successes, comparing and recording how much rain water different containers collect. Does this support their theories? The water collection is now saved for next week.

EYFS Curriculum links

Understanding the World. The World

- Use all their senses in hands-on exploration of natural materials
- Talk about what they see, using a wide vocabulary
- Explore how things work
- Begin to understand the need to respect the natural environment and all living things

Next steps for learning

How can children save water every day? - For example, turning off the tap when they brush their teeth . . .

Solids, Liquids & Gases

Overarching Twelve Week Focus

Materials and their properties

Weekly Aim

Week 3 Liquids: Evaporation

Stimulus

Images of the water cycle, an image of a water droplet and the containers (plus collected water) from last week

Input Framework

During the week children are enabled to explore the water cycle, considering from where water originates and what happens to it. Taking an image of a water droplet, children work collaboratively to tell the story of its journey - visually constructing a giant water cycle using pictures and objects over the course of the week. The water that the children collected last week, will have been saved, ensuring that no more rain water can be collected. Children will now measure daily how much water has remained in the containers and how much has evaporated. Are certain containers better at keeping the water than others? Why?

EYFS Curriculum links

Understanding the World. The World

- Use all their senses in hands-on exploration of natural materials
- Talk about what they see, using a wide vocabulary
- Explore how things work
- Begin to understand the need to respect the natural environment and all living things

Next steps for learning

What happens if you put a lid on the container that has water inside? Does the water still evaporate? Do all liquids evaporate or just water?

Solids, Liquids & Gases

Overarching Twelve Week Focus

Materials and their properties

Weekly Aim

Week 4 Liquids: Water pollution

Stimulus

A drill, a tray of blue water, vegetable oil, images of the ocean, plastic bags and images of sea birds, turtles etc. suffering the impact of pollution

Input Framework

Over the course of the early part of the week children explore where oil comes from, the reaction of oil with water and what the impact of an oil spillage is on the environment, animals. . . Towards the end of the week children look at images of plastic pollution in the sea and consider the global impact of rubbish. Experiments will take place to see whether children can easily wash off vegetable oil from their hands, without detergent. What are the consequences therefore for animals? What is oil used for? Using images, children create the story of oil – from beneath the ocean to the fuel station and then looking at different types of transport.

EYFS Curriculum links

Understanding the World. The World

- Use all their senses in hands-on exploration of natural materials
- Talk about what they see, using a wide vocabulary
- Explore how things work
- Begin to understand the need to respect the natural environment and all living things
- Talk about the differences between materials and changes they notice

Mathematics

- Begin to describe a sequence of events, real or fictional using words such as 'first', 'then . . .'

Next steps for learning

Is there a more environmentally sustainable way to travel? Can we reduce our plastic use?

Solids, Liquids & Gases

Overarching Twelve Week Focus

Materials and their properties

Weekly Aim

Week 1 Gases: Photosynthesis

Stimulus

Potted plants, bowl of sugar, balloon, watering can and water, image of a sun

Input Framework

Children begin the week considering how plants manage to survive without eating food as we need do. The practitioner introduces children to the concept of plants making their own food, but they need three essential ingredients – water, sunlight and carbon dioxide. This is now called photosynthesis rather than cooking. Another great benefit from photosynthesis is that plants make oxygen for us and all the oxygen breathing animals on the planet. Plants need our carbon dioxide and we need their oxygen. We have a very special co-dependent relationship. Initially the children will be supported to bring food for the plants to eat, and as it becomes apparent that they are not going to eat the food, children will research online how plants eat – utilising songs and videos on YouTube.

EYFS Curriculum links

Understanding the World. The World

- Use all their senses in hands-on exploration of natural materials
- Explore collections of materials with similar and/or different properties
- Talk about what they see, using a wide vocabulary
- Understand the key features of the life of a plant and an animal
- Begin to understand the need to respect the natural environment and all living things

Next steps for learning

Where else does carbon dioxide come from? If we have high levels of carbon dioxide and low numbers of trees, what happens?

Solids, Liquids & Gases

Overarching Twelve Week Focus

Materials and their properties

Weekly Aim

Week 2 Gases: Deforestation

Stimulus

Pile of sticks, animals – small world and images.

Input Framework

Children create a rainforest on the ground using piles of sticks. Practitioner discusses the critical nature of rainforests, recapping on the principles of photosynthesis from last week. During the early part of the week, children explore the different levels of the rainforest and which animals live amongst the different layers, adding animals to their rainforest model. As the week draws to a close children begin to reduce the number of sticks, until over half of them have gone – leaving many animals homeless. Children are encouraged to discuss the reasons behind this destruction and the impact on animals and humans.

EYFS Curriculum links

Understanding the World. The World

- Talk about what they see, using a wide vocabulary
- Understand the key features of the life of a plant and an animal
- Begin to understand the need to respect the natural environment and all living things

Next steps for learning

Consider the ecosystems closer to home and how you can support life within them.

Consider how small changes in our behaviours can help reduce demand on resources which lead to deforestation.

Solids, Liquids & Gases

Overarching Twelve Week Focus

Materials and their properties

Weekly Aim

Week 3 Gases: Carbon footprint

Stimulus

Toys, food, light bulb, images petrol/diesel vehicles, collage to make the planet earth on large scale. Tray of mud and old boot.

Input Framework

At the beginning of the week, children collectively use collage materials to make a large scale planet earth picture. Over the course of the next few days, children look at different objects and with practitioner support children are supported to understand the process of producing, using and transporting these objects. Recapping on their knowledge thus far of the production and use of carbon dioxide, children are helped to understand that carbon dioxide is constantly being produced by almost everything that we do. Children are reminded about the reduction of trees on our planet and the fact that we have less trees now to take the carbon dioxide away. Just like muddy footprints, carbon production is making our sky dirty and also hot. Children will each think of something that they do or use that creates a carbon footprint. Each time children think of a type of carbon emission, a muddy footprint is added to the collage of the planet earth. By the end of the week, children will have created a visual image of how the earth is being harmed by human behaviours.

EYFS Curriculum links

Understanding the World. The World

- Talk about what they see, using a wide vocabulary
- Show interest in different occupations
- Explore how things work
- Begin to understand the need to respect for natural environment and all living things

Next steps for learning

How can we improve our behaviours and reduce our carbon footprint?

Solids, Liquids & Gases

Overarching Twelve Week Focus

Materials and their properties

Weekly Aim

Week 4 Gases: Global Warming – Polar Icecaps

Stimulus

Tray with turf and small world scene, with 'ice bergs' and polar bears around the edge.

Input Framework

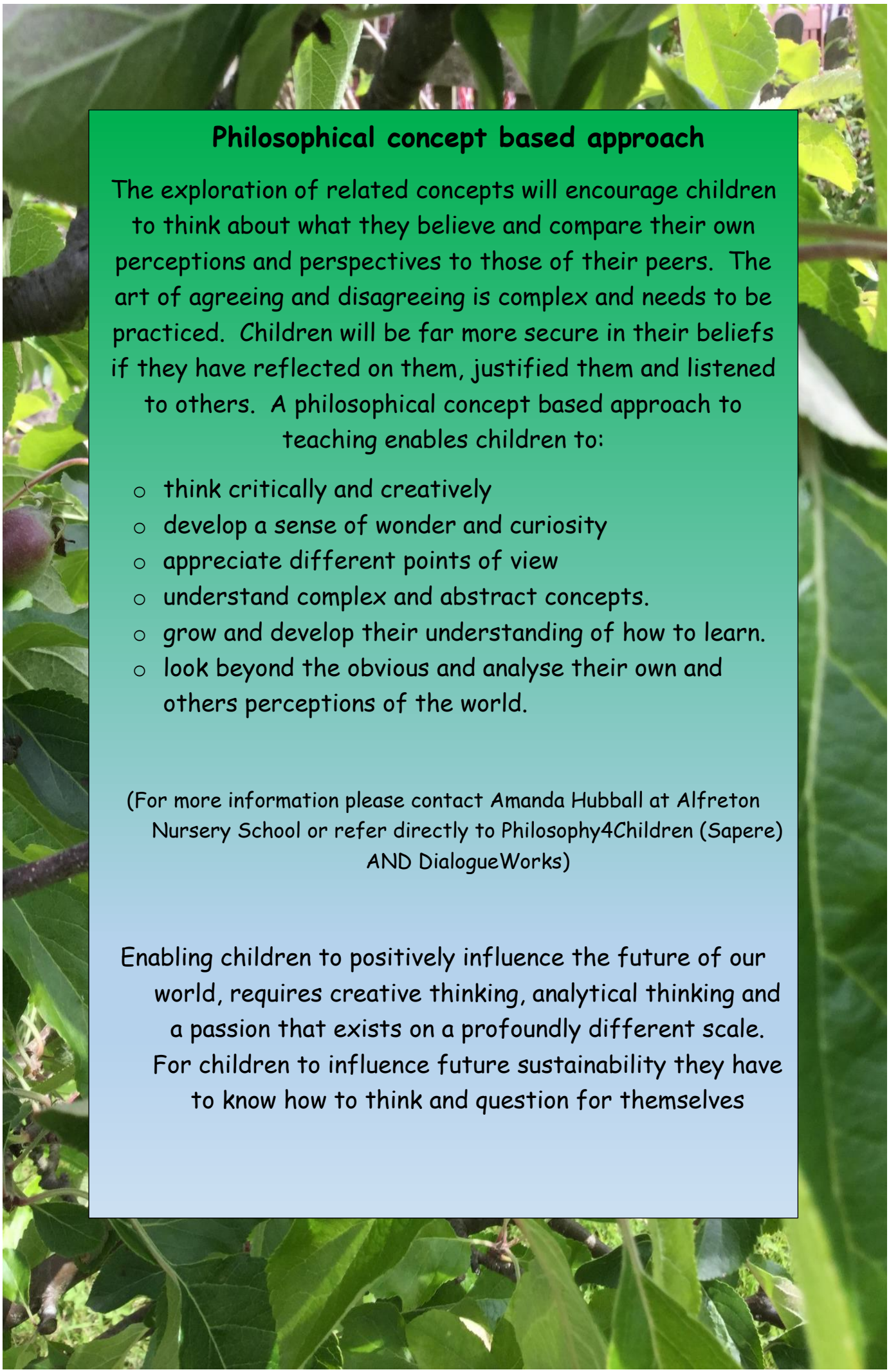
At the beginning of the week, children work together to build a scene which represents a landscape with people living on the land, and polar bears living in the ice. This scene is left in a tray and the ice is monitored – what has happened to the land and what has happened to the polar bears? This investigation is running alongside the lessons where children are being taught about the plight of the ice glaciers and supported to draw on their learning about carbon footprints. What is the global impact of sea levels rising? What will happen to polar bears and other arctic animals? Images and videos on the internet will support this work. Children are helped to see how the ice (a solid) is turned into a liquid (water), by the impact of greenhouse gases

EYFS Curriculum links

- Understanding the World. The World
- Use all their senses in hands-on exploration of natural materials
- Explore collections of materials with similar and/or different properties
- Talk about what they see, using a wide vocabulary
- Begin to understand the need to respect for the natural environment and all living things
- Talk about the differences between materials and changes they notice

Next steps for learning

Look at electric cars, solar power, wind turbines etc – can we produce energy to sustain human activity, which does not harm the planet?



Philosophical concept based approach

The exploration of related concepts will encourage children to think about what they believe and compare their own perceptions and perspectives to those of their peers. The art of agreeing and disagreeing is complex and needs to be practiced. Children will be far more secure in their beliefs if they have reflected on them, justified them and listened to others. A philosophical concept based approach to teaching enables children to:

- think critically and creatively
- develop a sense of wonder and curiosity
- appreciate different points of view
- understand complex and abstract concepts.
- grow and develop their understanding of how to learn.
- look beyond the obvious and analyse their own and others perceptions of the world.

(For more information please contact Amanda Hubball at Alfreton Nursery School or refer directly to Philosophy4Children (Sapere) AND DialogueWorks)

Enabling children to positively influence the future of our world, requires creative thinking, analytical thinking and a passion that exists on a profoundly different scale. For children to influence future sustainability they have to know how to think and question for themselves

Science and Maths Progress and Attainment Assessment Sheet

Term:	Assessment pre 12 week input		Assessment post 12 week input	
	Emerging, Established, Exceeding		Emerging, Established, Exceeding	
Children's Names	Science UW	Maths	Science UW	Maths

Environmental Understanding

Teacher evaluation of group progress:

Date: Class/Practitioner:

Teaching and Learning Targets for More Able Pupils –

Working towards:

Understanding the World ELG: The Natural World

Children at the expected level of development will: - Explore the natural world around them, making observations and drawing pictures of animals and plants; - Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class; - Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.

National Curriculum, Key Stage 1, Attainment Target.

The principal focus of science teaching in key stage 1 is to enable pupils to experience and observe phenomena, looking more closely at the natural and humanly-constructed world around them. They should be encouraged to be curious and ask questions about what they notice. They should be helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information. They should begin to use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done through the use of first-hand practical experiences, but there should also be some use of appropriate secondary sources, such as books, photographs and videos.

National Curriculum Key Stage 1, Programme of Study for Years 1 & 2

Working scientifically: Statutory requirements: During years 1 and 2, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content: asking simple questions and recognising that they can be answered in different ways observing closely, using simple equipment performing simple tests identifying and classifying using their observations and ideas to suggest answers to questions gathering and recording data to help in answering questions.

National Curriculum Key Stage 1, Year 1, Programme of Study

Everyday materials: Statutory requirements - Pupils should be taught to: distinguish between an object and the material from which it is made identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock describe the simple physical properties of a variety of everyday materials compare and group together a variety of everyday materials on the basis of their simple physical properties.

Solids, Liquids & Gases

Facts and definitions to support Teaching and Learning

Solids

Solids have a shape that resists change. A solid does not change its shape to fit a container into which it is placed and it does not flow or move around as liquids and gases do.

Liquids

A liquid has no shape of its own, taking on the shape of whatever container it is put into. Unlike a gas, a liquid does not expand to fill every space of a container. Its volume is constant.

Gases

Gases move around freely unless placed in a sealed container. They don't have a shape and usually you can't feel or see them. If gases are not in sealed containers, they spread easily and they are in the air that we breathe. Sometimes we can smell a gas. Solids and liquids can stay still, but gases move around constantly. A gas will expand to fill whatever area it is in.

Environmental – facts accurate as of July 2019

- Over 70% of the earth is water and that includes the ocean, rivers and ice glaciers. Nearly 97 percent of all the world's water is salty or otherwise undrinkable. Another 2 percent is locked in ice caps and glaciers. That leaves 1 percent for all our needs.
- An estimated 50,000 species inhabiting our tropical forests become extinct annually. That's an average of 137 species a day.
- In just one generation, our production of man-made chemicals increased by 40,000% - from 1 million to 400 million tons.
- In the last 200 years, we have added 2.3 trillion tons of carbon dioxide in to our atmosphere. Half of this amount was added in the last 30-35 years.
- Between 1990 and 2016, the world lost 502,000 square miles (1.3 million square kilometres) of forest, according to the World Bank—an area larger than South Africa.

Family and Community Involvement

- Facebook, Twitter, Instagram . . . to share explorations, reflections, findings and ideas for further learning.
- Family friendly ideas and fact sheets to encourage activities out of the classroom.
- Community days, welcoming members of the community into school, to share in the learning of the children during this project.
- Photographic displays in school, illustrating the learning adventures children have experienced.
- Written and photographic records in children's learning journals/portfolios
- Displays in libraries and other community based areas.

Spreading the word and sharing good practice is an essential element to raising standards for all children and promoting the work that is done in school. Cross generational members of our communities are often extremely interested in the work we undertake in school. Welcoming families and communities into our educational offer, places cultural capital at the heart of what we do.

This document is free for download and has been produced by Amanda Hubball, teacher at Alfreton Nursery School and Specialist Leader of Education for Alfreton Nursery Teaching School.

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